

What is claimed is:

- 004240-5049550
1. An apparatus for treating a fluent material with a heated fluid comprising a pressure vessel, dispensing means mounted within said vessel for distributing the fluent material in a selected pattern including a plurality of spaced apart sprays, fluid outlet means coupled to said vessel for withdrawing treated fluent material therefrom, said vessel having a longitudinal axis extending substantially vertically, an upper portion having an inlet for the fluent material to be treated, said inlet being connected to said means mounted within said vessel for distributing the fluent material, said vessel having an inlet for said heated fluid, baffle means within said vessel for regulating the distribution of the heated fluid in said vessel and an outlet for any non-condensable gases generated during the treatment at the upper portion of said vessel.
 2. The apparatus as claimed in claim 1, wherein said dispensing means comprises a hollow housing connected to said inlet, said pressure vessel having an interior surface surrounding said housing with said housing having dimensions said such that a selected distance is present between the surface of said housing and said interior surface of said pressure vessel.
 3. The apparatus as claimed in claim 2, wherein said housing has a longitudinal axis and said housing is located so that said longitudinal axis of said housing lies along said longitudinal axis of said pressure vessel.
 4. The apparatus as claimed in claim 2, wherein said housing has a peripheral surface and a longitudinal axis, said peripheral surface having a plurality of circumferential rows of apertures formed therein with the apertures of one row being offset vertically relative to the apertures of an adjacent row.
 5. The apparatus as claimed in claim 4, wherein each of said apertures is

provided with a fluid distribution nozzle.

6. The apparatus as claimed in claim 5, wherein each of said nozzles is provided with a distribution opening for projecting the fluid material passing there through in a flat spray pattern having substantially the same angular width.

7. The apparatus as claimed in claim 6, wherein an interior chamber is provided in said pressure vessel having a lower open end facing said outlet of said pressure vessel, the angular width of the spray pattern is selected so that each spray pattern from each nozzle contacts said interior chamber of said pressure vessel without any substantial contact between adjacent spray patterns from adjacent nozzles.

8. The apparatus as claimed in claim 6, wherein each nozzle is directed at an acute angle to the longitudinal axis of said housing.

9. The apparatus as claimed in claim 8, wherein said acute angle is in the range of 30 degrees and 60 degrees.

10. The apparatus as claimed in claim 7 wherein said interior chamber has a selected diameter and said housing has a diameter in the range of 10 to 20% of said selected diameter.

11. The apparatus as claimed in claim 1 wherein at least one baffle is provided between the interior wall of said vessel and said partition wall.

12. The apparatus as claimed in claim 11 wherein apertures are provided in the surfaces of said baffle.

13. The apparatus as claimed in claim 12 wherein a plurality of said baffles are spaced apart along the axis of said vessel and the size of said apertures in said

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baffles decreases in size as the distance from said inlet for the heated fluid increases so as to provide a pressure head above at least some of said baffles.

14. A method of subjecting a fluent material to heat treatment using a pressure vessel of a type having inlets adjacent one end for a heating medium and the fluent material to be treated, a partition wall defining a chamber and having an open end and in which a fluent material distributor is located, comprising the steps of a) introducing the heating medium in the vessel at a point outside the partition wall, b) venting a portion of the heat medium from the one end of the vessel through said chamber, c) introducing fluent material from said distributor into said chamber to allow the fluent material to come into contact with the heating medium flowing through the chamber in counter flow to the direction of movement of the heating medium.

15. The method as claimed in claim 14 including the step of distributing the fluent material in said chamber in the form of a plurality of highly turbulent, discrete sprays distributed about said fluent material distributor.

16. The method as claimed in claim 15 including the step of impinging the sprays on the partition wall to cause the sprays to break up and to flow downwardly to an edge of said partition wall and including the step of locating baffles about said partition wall to control the flow of the material to the edge of the partition wall.

17. A method for subjecting a fluent food product to heat treatment using a pressure vessel of a type having inlet means adjacent one end of the vessel for a heating medium and a partition wall defining a treatment chamber having a fluent food product distribution device attached to an inlet for the food product adjacent the one end of the vessel, the treatment chamber having an open end located in spaced relation to the inlet means, comprising the steps of: a) introducing the heating medium into the vessel at a point outside the partition wall, b) venting at least a portion of the heating medium from one end of the vessel through the

9 treatment chamber so as to establish a flow direction for the heating medium in
10 the treatment chamber from the open end toward the one end of the vessel, c)
11 introducing the fluent food product from the distribution device in the form of a
12 plurality of substantially discrete flat sprays directed at the interior wall of the
5/3 treatment chamber with a pressure sufficient to cause the sprays to impact
against the interior wall of the treatment chamber while still turbulent.

18. The method as claimed in claim 17 including the step of directing the sprays
at an acute angle to the interior wall of the treatment chamber.

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19. The method as claimed in claim 18 wherein said acute angle is ⁱⁿ the range of
45 degrees and 60 degrees.

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20. The method as claimed in claim 17 including the step of providing spaces
between the sprays to allow the heating medium to pass through the spaces so
provided.

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21. The method as claimed in claim 17 including the step of venting the heating
medium and any non-condensable gases from the one end of the vessel and
treatment chamber.

22. The method as claimed in claim 17 including the step of ^{using} steam as the
heating medium.

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23. The method as claimed in claim 17 including the step of ^{using} milk as the
fluent food product.

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^{in whole or in part}
24. A method of producing a powdered milk product from fresh milk comprising
the steps of feeding the fresh milk to at least one evaporator and either
before or after the at least one evaporator, subjecting the milk to heat
4 treatment using a pressure vessel of a type having ^{24a} inlet means adjacent one

- 5 end of the vessel for a heating medium and a partition wall defining a treatment chamber having a fluent food product distribution device attached
- 7 to an inlet for the food product adjacent the one end of the vessel, the treatment chamber having an open end located in spaced relation to the inlet
- 5 means, and introducing the heating medium into the vessel at a point outside
- 10 the partition wall, venting at least a portion of the heating medium from one end of the vessel through the treatment chamber so as to establish a flow
- 13 toward the one end of the vessel, introducing the fresh milk from the distribution device in the form of a plurality of substantially discrete flat
- 15 sprays directed at the interior wall of the treatment chamber with a pressure sufficient to cause the sprays to impact against the interior wall of the treatment chamber while still turbulent, removing the milk product from the vessel and passing the product to a dryer.
- 15 25. The method as claimed in claim 24 including the step of maintaining the milk in the treatment chamber between 2 seconds and 30 seconds.
26. The method as claimed in claim 25 wherein the step of maintaining the milk in the treatment chamber is for approximately 5 seconds.
- 20 27. The method as claimed in claim 24 including the step of using a plurality of evaporator devices and selecting a site among the devices, including before a first one and after the last one of the devices and positioning the vessel to receive milk product at that site and after heat treatment, passing the milk product to a subsequent stage.
28. A powdered milk product made according to claim 24.
- 25 29. A powdered milk product made according to claim 25.
30. A powdered milk product made according to claim 26.
31. A powdered milk product made according to claim 27.

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